IN THE CLAIMS

Please amend the claims as follows:

1. (Currently Amended) A method for positioning of an audio signal comprising ~~steps of~~:

selecting a set of spatial functions, each having an associated scaling factor;

providing a first set of amplifiers and a second set of amplifiers, the gains of the amplifiers being a function of the scaling factors;

receiving a first audio signal;

providing a direction representing the direction of the source of the first audio signal;

adjusting the scaling factors depending on the direction;

applying the first set of amplifiers to the first audio signal to produce first encoded signals to provide a left-channel audio output;

delaying the first audio signal to produce a delayed audio signal; and

applying the second set of amplifiers to the delayed audio signal to produce second encoded signals to provide a right-channel audio output, the left-channel audio output excluding the second encoded signals and the right-channel audio output excluding the first encoded signals.

2. (Original) The method of claim 1 wherein the spatial functions are spherical harmonic functions.

3. (Original) The method of claim 2 wherein the spherical harmonic functions include at least the first-order harmonics.

4. (Original) The method of claim 1 wherein the spatial functions are discrete panning functions.

5. (Currently Amended) The method of claim 1 wherein for each of the first and second sets of amplifiers, the gain of each amplifier is based on [[the]] a B-format encoding scheme.

6. (Original) The method of claim 1 further including:

providing a third set of amplifiers and a fourth set of amplifiers, the gains of the amplifiers being a function of the scaling factors;

receiving a second audio signal;

providing a direction representing the direction of the source of the second audio signal;

adjusting the scaling factors depending on the direction;

applying the third set of amplifiers to the second audio signal to produce third encoded signals;

delaying the second audio signal to produce a second delayed audio signal;

applying the fourth set of amplifiers to the second delayed audio signal to produce fourth encoded signals;

mixing the first and the third encoded signals, or the first and the fourth encoded signals; and

mixing the second and the fourth encoded signals, or the second and the third encoded signals.

7. (Original) The method of claim 6 wherein the second signal is a synthesized audio signal.

8. (Currently Amended) The method of claim 1 further <u>including:</u> ~~including a~~ decoding the encoded signals, the decoder comprising filters defined based on the spatial functions.

9-19. (Canceled)

20. (Currently Amended) A method of producing an audio signal from directionally encoded audio signals comprising ~~steps of~~:

<u>selecting a set of spatial functions;</u>

~~receiving directionally encoded audio signals according to a set of spatial functions;~~

generating a set of spectral functions based on the spatial functions;

receiving a first set of directionally encoded audio signals encoded according to the set of spatial functions;

receiving a second of set directionally encoded audio signals encoded according to the set of spatial functions;

providing a first set of decoding filters defined by [[left]] the set of spectral functions;

providing a second set of decoding filters defined by [[right]] the set of spectral functions;

applying the first set of decoding filters to the first set of directionally encoded audio signals to produce a first set of filtered signals ~~left-channel audio signal~~; ~~and~~

applying the second set of decoding filters to the second set of directionally encoded audio signals to produce a second set of filtered signals ~~right-channel audio signal~~; and

providing the first set of filtered signals to a left-channel audio signal and providing the second set of filtered signals to a right-channel audio signal, the left-channel audio signal excluding the second set of filtered signals and the right-channel audio signal excluding the first set of filtered signals.

21. (Currently Amended) The method of claim 20 wherein the set of spatial functions is defined by $\{g_i(\theta, \phi), i = 0, 1, \ldots N\text{-}1\}$ and ~~the step of~~ generating the spectral functions includes providing $L_i(f)$ and $R_i(f)$ such that $\Sigma_{\{i=0,\ldots N\text{-}1\}}\, g_i(\theta_p, \phi_p)\, L_i(f)$ approximates $\underline{L}(\theta_p, \phi_p, f)$ and $\Sigma_{\{i=0,\ldots N\text{-}1\}}\, g_i(\theta_p, \phi_p)\, R_i(f)$ approximates $\underline{R}(\theta_p, \phi_p, f)$, where $\underline{L}(\theta_p, \phi_p, f)$ is a set of left-ear HRTFs and $\underline{R}(\theta_p, \phi_p, f)$ is a set of right-ear HRTFs, where $\{ [[\theta_p, \phi_p)]]\ \underline{(\theta_p, \phi_p)}, p = 1, 2, \ldots P\}$ is a set of directions and f is frequency.

22. (Original) The method of claim 21 wherein $\underline{L}(\theta_p, \phi_p, f)$ and $\underline{R}(\theta_p, \phi_p, f)$ are delay-free HRTFs.

23. (Currently Amended) The method of claim 21 wherein providing $L_i(f)$ includes solving, at each frequency f, the vector equation $\underline{L} \cong \boldsymbol{G}L_{,,}$ where:

the set of left-ear HRTFs $\underline{L}(\theta_p, \phi_p, f)$ define a [[Px1]] $\underline{P\text{x}1}$ vector $\underline{L}$,

$\boldsymbol{G}$ is a $P\text{x}N$ matrix whose columns are $P\text{x}1$ vectors $[[G_{i,}]]\ \underline{G_i}$, $i = 0, 1, \ldots N\text{-}1$

each of the [[N]] $\underline{N}$ spatial functions $g_i(\theta_p, \phi_p, f)$ defines the vector G_i, and the set of [[$L_i(f)$]] $\underline{L_i(f)}$ defines the Nx1 vector L.

24. (Currently Amended) The method of claim 23 wherein providing [[$L_i(f)$]] $\underline{L_i(f)}$ is obtained by pseudo-inversion of the matrix G, resulting in $L = (G^T G)^{-1} G^T \underline{L}$.

25. (Currently Amended) The method of claim 24 wherein providing [[$L_i(f)$]] $\underline{L_i(f)}$ includes projecting [[a]] the Px1 vector [[L]] $\underline{L}$ formed by the set of left-ear HRTFs $\underline{L}(\theta_p, \phi_p, f)$ over each of the Px1 vectors G_i formed by the spatial functions [[g_i]] $\underline{g_i}(\theta_p, \phi_p)$ to compute the scalar product [[L_i]] $\underline{L_i}$.

26. (Original) The method according to claim 25 wherein an Nx1 vector L formed by the scalar products L_i is multiplied by the inverse of the Gram matrix $G^T G$.

27. (Original) The method of claim 23 wherein providing $L_i(f)$ is obtained by $L = (G^T \Delta G)^{-1} G^T \Delta \underline{L}$ where Δ is a diagonal PxP matrix where the P diagonal elements are weights applied to the individual directions (θ_p, ϕ_p), $p = 1, 2, \ldots P$.

28. (Currently Amended) The method of claim [[20]] 27 where each weight is proportional to a solid angle associated with the corresponding direction.

29. (Currently Amended) The method of claim [[28]] 20 wherein the spatial functions are spherical harmonic functions.

30. (Currently Amended) The method of claim [[21]] 29 wherein the spherical harmonic functions include at least zero- and first-order harmonics.

31. (Currently Amended) The method of claim [[20]] 30 wherein the spectral functions define filters $L_W(f)$, $L_X(f)$, $L_Y(f)$, and $L_Z(f)$ effective for decoding binaural B-format encoded signals W_L, X_L, Y_L, Z_L W_R, X_R, Y_R, and Z_R, wherein the left-channel audio signal is defined by W_L

$L_W(f) + X_L L_X(f) + Y_L L_Y(f) + Z_L L_Z(f)$ and the right-channel audio signal is defined by $W_R L_W(f) + X_R L_X(f) - Y_R L_Y(f) + Z_R L_Z(f)$; whereby the left- and right-channel audio signals are suitable for playback with headphones.

32. (Currently Amended) The method of claim [[20]] 30 wherein the spectral functions define filters $L_W(f)$, $L_X(f)$, $L_Y(f)$, and $L_Z(f)$ effective for decoding binaural B-format encoded signals W_L, X_L, Y_L, Z_L W_R, X_R, Y_R, and Z_R; wherein the left-channel audio signal comprises two signals

a first signal $LF = 0.5\{[W_L + X_L][L_w(f) + L_X(f)] + Y_L L_Y(f) + Z_L L_Z(f)\}$ and

a second signal $LB = 0.5\{[W_L - X_L][L_W(f) - L_X(f)] + Y_L L_Y(f) + Z_L L_Z(f)\}$;

and wherein the right-channel audio signal comprises two signals

a first signal $RF = 0.5\{[W_R + X_R][L_W(f) + L_x(f)] + Y_R L_Y(f) + Z_R L_Z(f)\}$ and

a second signal $RB = 0.5\{[W_R - X_R][L_W(f) - L_X(f)] - Y_R L_Y(f) + Z_R L_Z(f)\}$;

whereby the left- and right- channel audio signals are suitable for playback over a pair of front speakers and a pair of rear speakers.

33. (Original) The method of claim 32 further including:

performing a first cross-talk cancellation on the *LF* and *RF* signals to feed the front speakers; and

performing a second cross-talk cancellation on the *LB* and *RB* signals to feed the rear speakers.

34. (Original) The method of claim 20 wherein the spatial functions are discrete panning functions having a direction, called a principal direction, where the spatial function is maximum and wherein all other spatial functions are zero.

35. (Original) The method of claim 34 wherein the spectral function associated with each spatial function is the delay-free HRTF for the corresponding principal direction.

36. (Currently Amended) The method according to claims 34 or 35 wherein one or more of the spatial functions have their principal direction corresponding to [[the]] a direction of one of the loudspeakers.

37. (Original) The method according to claims 33 or 36 including performing cross-talk cancellation of the left and right audio signals before feeding the loudspeakers.

38. (Original) The method of claims 34 or 35 further including:

producing left-front and left-back signals based on the left-channel audio signal;

producing right-front and right-back signals based on the right-channel audio signal; and

combining the left-front, left-back, right-front, and right-back signals to produce outputs suitable for playback with a pair of front speakers and a pair of rear speakers.

39. (Original) The method of claim 38 further including:

performing a first cross-talk cancellation on the left-front and right-front signals to feed the front speakers; and

performing a second cross-talk cancellation on the left-back and right-back signals to feed the rear speakers.

40. (Currently Amended) The method of claim 39 wherein one or more of the spatial functions have their principal direction corresponding to the direction of [[the]] a loudspeaker.

41-49. (Canceled)